BEAM DIVISION DEPARTMENTAL PROCEDURE

BD/MECHANICAL SUPPORT

BDDP-ME-0707

ANTIPROTON SOURCE PROTON - BEAM FORWARD DIRECTION PROCEDURE

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1.0 PURPOSE AND SCOPE

The purpose of this procedure is to establish the necessary methods and outline the potential hazards associated with running proton beam forward through the Antiproton Source. Since the Target S.E.M, Pulsed Magnet, Collection Lens, and Antiproton Target are directly in the path of the primary proton beam, ***special precautions are therefore necessary to ensure the safety of personnel and these assemblies.*** This procedure outlines the steps to change the Antiproton Source, for running the proton beam forward, by lifting the Target S.E.M. module, the Collection Lens module, the Antiproton Target module, and the assorted filler modules out off the proton beam path.

2.0 RESPONSIBILITIES

At the request of the Antiproton Source Department, Mechanical Support Department personnel will coordinate all necessary pre-planning tasks, interface with appropriate Beams Division Radiation Safety personnel, and perform the proton beam forward direction change. The Antiproton Source Department Head or his designee are to be present during the change operation.

3.0 SUPPORTING DOCUMENTS

3.1 DRAWING REFERENCE

The following drawings may be referenced should questions concerning hardware configuration arise:

3.1.1 Antiproton Source- Basic Block: 8000-ME-169051

3.1.2 Antiproton Source- Large Lithium Lens Module Sub-Assembly: 8000-ME-169058

3.1.3 Antiproton Source- Module Top Assembly: 8000-ME-169142

3.1.4 Antiproton Source- Lithium Lens Assembly: 8000-ME-216000

3.1.5 Antiproton Source- Lithium Lens Septum Welded Subassembly: 8000-MD-216006

3.1.6 Antiproton Source- Lithium Lens Transformer Assembly: 8000-ME-170328

3.1.7 Antiproton Source- Transformer Stand Assembly: 8000-ME-208547

3.1.8 Antiproton Source- Lens Module Stripline Assembly: 8000-ME-254441

3.1.9 Antiproton Source- Strip Line Clamp Eccentrics Crank Layout: 8000-ME-216582

3.1.10 Antiproton Source- Mark II Target Module Assembly: 8000-ME-254200

3.1.11 Antiproton Source- Target Module Lower Assembly: 8000-ME-254179

3.1.12 Antiproton Source- Target Module Assembly: 8000-ME-254137

3.1.13 Antiproton Source-Pbar Mark II Target Stand: 8000-ME-254191

3.1.14 Antiproton Source- Target Hall Module Lifting Fixture Weldment and Assembly: 8000-ME-216293

3.1.15 Antiproton Source – Universal Module Assembly: 8000-ME- 322269

3.1.15 Antiproton Source – Secondary Emissions Monitor: 8030.000-ME-322232

3.2 PROCEDURE REFERENCE

3.2.1 Pulsed Magnet Power Supply Lockout/Tagout Procedure: BDDP-AP-0024

3.2.2 Collection Lens Power Supply Lockout/Tagout Procedure: BDDP-AP-0042

3.3 ENGINEERING SPECIFICATION REFERENCE

3.3.1 AP0 Target Hall Module Lifting Fixture: 1323-ES-296153

4.0 INSTRUCTIONS

4.1 PRELIMINARY ACTIVITIES

Before executing the Proton Beam Forward change, certain preliminary activities must be addressed. The BD/Radiation Safety Group should be notified of the impending change and all lead personnel involved in the change must attend a pre-job planning meeting. ***The personnel performing the change shall have completed required radiation training (as specified by BD/Radiation Safety), and the task supervisor must obtain an approved radiation work permit from the BD/Radiation Safety Group.***

NOTE: Any deviation from the following steps during the procedure will require that workers involved in the changeout and the Beams Division Radiation Safety Officer (BD/RSO) or his designee meet and discuss the implications of the procedural change. The purpose of such a meeting is to

estimate and minimize potential hazards and radiation exposure workers may encounter during the modified procedure.

4.1.1 BD/RADIATION SAFETY GROUP INVOLVEMENT

Since the level of residual radioactivity on these assemblies are typically Class 4 or higher, Beams Division/Radiation Safety personnel must be present during all phases of the changeout to properly monitor and supervise activities relevant to personnel radiation safety. All personnel entering the vault enclosure will be monitored with a minimum of TLD badges, personnel dosimeters. Radiation Safety Personnel will specify additional precautions as discussed in the pre-job planning meeting (4.1.3) or as deemed necessary on site during the change activity. All radioactive waste leaving the vault shall be disposed of in accordance with the Beams Division Radioactive Waste Disposal Procedure, BDRS06**.** ***All personnel and tools leaving the vault enclosure must be frisked for contamination upon every exit of the vault enclosure.*** Additional functions of Radiation Safety include monitoring vault access, specifying clothing and special dosimetry requirements, unlocking and securing appropriate radiation security padlocks (i.e., Pad 118 locks), and performing radiation surveys and contamination checks.

4.1.2 PRE-JOB PLANNING MEETING

Prior to performing the Proton Beam Forward change, all lead personnel involved in the activity and the BD/RSO or his designee must have a meeting to examine the required steps and to estimate the integrated exposure that workers are expected to receive during each phase of activity. Topics which shall be addressed at the meeting include but are not limited to:

a. This BDDP procedure and the steps outlined within to ensure that the level of radiation which each individual is expected to receive is as low as reasonably achievable (ALARA).

b. Additional radiation monitoring required during specific phases of the change activity (e.g. use of digital dosimeters, monitoring radiation levels using a teletector, check of surface contamination, etc.).

c. Clothing, time, distance, and shielding requirements for personnel during critical phases of the Proton Beam Forward change.

d. Discussing special topics or requests which are (or will be) outline in the Radiation Work Permit (4.1.5).

e. Proposed activities that deviate from the normal Proton Beam Forward change outlined herein. Such activities shall be discussed and modified, if required, to comply with applicable Fermilab Standards.

4.1.3 TRAINING

All personnel participating in the change activity shall have current Radiological Worker and Radioactive Waste Disposal training. Verification may be found on the monthly Beams Division Safety Training printout, the TRAIN database, or by contacting the Beams Division ES&H Department. If required, the BD/Radiation Safety Group will specify additional training prior to performing the change.

4.1.4 RADIATION WORK PERMIT

Prior to initiating any work associated with the Forward Proton Beam change, a Radiation Work Permit must be completed by the task supervisor, approved by the Radiation Safety Officer, or his designee, and signed by all workers involved in the change. The task supervisor may contact the BD/Radiation Safety Group for the proper format to follow in completing the permit.

4.2 GENERAL MODULE LIFTING REQUIREMENTS

4.2.1 LOTO VAULT DEVICES

Before accessing the vault enclosure, the collection lens main power supply, bias power supply, pulsed magnet power supply, and the target air supply breaker box must be locked out and tagged out (LOTO) per Laboratory Standard 5120 of the Fermilab ES&H manual.

4.2.2 CRANE SAFETY

Any person(s) operating the 20 ton crane located in the AP0 target hall enclosure must be a licensed and certified crane operator. Verification may be found on the monthly Beams Division Safety Training printout, the TRAIN database, or by contacting the Beams Division ES&H Department. The prior to use inspection of the crane and rigging components shall be conducted by the certified operator.

4.2.3 SHIELDING BLOCK REMOVAL

Subsequent to LOTO, the concrete vault shielding blocks and must be unlocked by Radiation Safety personnel, removed from the vault enclosure, and placed on the floor of the AP0 enclosure at the north end of the building near the hi-bay entrance. ***All lifting hooks and chains will be inspected prior to lifting the shielding blocks and operations will comply with Laboratory Standard 5021 of the Fermilab ES&H Manual.***

4.2.4 MODULE LIFTING FIXTURE

The lifting fixture used for pulling modules is depicted in drawing 8000-ME-216293 and has a load rating of 25,000 lbs. (ref. Engineering Spec 1323-ES-296153). The weight of the steel modules block alone accounts for approximately 7500 lbs. (module dimensions are 72"x32"x11.375"). Support hardware of these assemblies could account for an additional 600 lb. load to the module assembly. ***Prior to lifting, the fixture and associated lift hardware shall be visually checked for signs of damage.***

4.3 DISENGAGING TARGET S.E.M., TARGET, AND LENS/TRANSFORMER ASSEMBLIES

4.3.1 GENERAL PREPARATIONS

Prior to lifting the modules out of the proton beam path, the following items shall be accomplished:

a. Check that all the wood blocks and the V-blocks are available to support the modules.

b. Ensure that the length of each piece of wood is 18" or longer.

4.3.2 REMOVAL STEPS

BD/Radiation Safety personnel will provide digital dosimeters for persons requiring such monitoring and specify clothing requirements for all subsequent operations as discussed in the pre-job planning meeting or as deemed necessary on site during the Forward Proton Beam change activity. ***After all of the module assemblies have been lifted from the beam path, all personnel and tools leaving the vault enclosure during the change shall be frisked to check for possible contamination upon every exit of the vault enclosure. Hardware removed from the vault enclosure (e.g. defective hardware removed from the top of the module which typically falls into Class 1 or Class 2 category) will be checked for radioactivity by the person removing the material, accordingly tagged if radioactive, and disposed of per BDRS06.*** The following sequence shall be followed for the Target S.E.M., Target, and Lens/Transformer disengagement:

a. Disconnect all read back cables, instrumentation lines and the ground straps on the top of the Target S.E.M. module.

b. Move the target to center of the module. On the top of the target module, disconnect the air hose, instrumentation lines, all read back cables, and the ground strap.

c. On the top of the collection lens module, disconnect all read back cables, instrumentation lines, the ground strap, and stripline connections.

d. Radiation Safety personnel will then unlock the safety padlocks securing the S.E.M. module, target module, collection lens module and the filler block immediately downstream of the collection lens module.

e. Secure the module lifting fixture to the Target S.E.M. module. Lift the Target S.E.M. module upward approximately 20" off the locating rail, place the spare v-blocks on the rail on both sides of the module, insert the wood blocks (min. 18" high), and lower the Target S.E.M. module onto the wood blocks. Secure the Target S.E.M. module by using 3/8" wide Band-It valustrap wrap around the module and the wood.

f. Repeat step e for the Target module.

g. Repeat step e for the Collection Lens module.

h. Disconnect the Pulsed Magnet stripline and reconnect it for Forward Proton Operation.

i. Radiation Safety personnel may now padlock and secure the modules.

j. Replace the vault shielding blocks. Frisk all personnel and tools. Radiation Safety personnel may now secure the vault enclosure gate.

k. Remove (LOTO) locks and tags ***only from the pulsed magnet power supply.***

5.0 CONTROLLED COPY DISTRIBUTION

5.0.1 Reference Appendix A. The Mechanical Support Department Head is responsible for approving Appendix revisions.

APPROVED_____ DATE_____
Mechanical Support Department Head

APPENDIX A: Controlled Copy Distribution List

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1	Mechanical Support Department Head Fritz Lange
2	Antiproton Source Department Head Dave McGinnis
3	BD ES&H Department Head Mike Andrews
4	Responsible Engineer Jeff Bielicki